Redefining entrepreneurialism in the maker movement: A critical youth approach

By: Day Greenberg, Angela Calabrese Barton, Edna Tan, and Louise Archer

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Abstract:

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Keywords: ethnographic study | maker-entrepreneurialism | STEM | entrepreneurship | social justice

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Redefining entrepreneurialism in the maker movement: A critical youth approach

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ABSTRACT

Background: This paper explores traditional iterations of, and new challenges to, the tightly linked discourses of entrepreneurship and innovation within the maker movement.

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> This project means, to me … there's kids everywhere … that don't have access to libraries and books and things. So we've got a Little Free Library. It's free. All they got to do is write their name, first and last, and their grade and the book they're taking out, so we can keep track. They don't have to return them, but they can. Sometimes they like to keep the books, and maybe they can give them to their little brothers and sisters or something, so they can learn how to read too. And we got some little maker kits, too … The materials are copper tape, a piece of paper, and light, and maybe a hand crank or a battery. You can use the hand crank to light up the light or the batteries. But you've just gotta have a closed circuit to make the light. (Samuel, March 2016 Interview)

Samuel, a 14-year-old Black youth maker, offered these words while being interviewed at a local Youth Entrepreneurial Faire (hereafter referred to as the Faire). Samuel had participated, along with eleven other youth makers from his community center's Green Club, to showcase their efforts to engage in STEM-rich making in ways that valued and supported their community. Samuel's comments came in response to being asked about his project—a solar-powered light-up Little Free STEM Library—that he and his friend, Fall, built because their neighborhood was located in, in their words, a "library desert." A Little Free STEM library, stocked with STEM books of all levels and types, and mini-maker kits, located centrally at a vibrant community center, offered the members of his community unfettered access to STEM-rich learning resources. As he noted in his project description, the Little Free STEM Library, while being shared at an entrepreneurial fair, was always intended to be "not-for-profit":

> We do not want to make money from it. What we want to do is provide opportunities to the kids in our community, where there are no other opportunities. We know what it is like to not be able to get to the library and not be able to make the kind of inventions that we think up in our heads.

His maker project was imbued with care for his community, targeted to enhance access to a safe, playful, and educational life. He enacted his care by identifying current and predicting future community need, and then undertaking the challenge of addressing that need through innovative maker practices. As evident in the opening quote, making for community out of deep care, often to address specific injustices, undergirds the discourse and practices that grounded Samuel's identity work as a maker.

Samuel and his Green Club peers, with help from adult mentors, sought out the Faire to share their innovations, and to benefit from the event's platform for city-wide public recognition through cash prizes, newspaper/television coverage, and verbal praise in front of a large audience. This complicated their maker identities in specific ways we explore in this study, ultimately leading to youth pushing for a new space of practice in both the maker movement and in youth entrepreneurial education. We are terming this new space of practice "critical maker-entrepreneurialism." Entrepreneurship or

entrepreneurialism is a term historically laminated with tensions related to inequitable economic structures of power and oppression (Ogbor, 2000). Thus, we enter this dialogue carefully and with a critical eye toward unpacking assumptions and definitions about who entrepreneurs are and what they can do. Originally, *entrepreneur* began as a French term translating to one who "undertakes" something (see its first use as a term by Cantillon, 1755, as cited in Ogbor, 2000, p. 615). Undertaking is about taking action connected to the acceptance of responsibility. Deconstructing this term, when one takes something *from under* (like an especially heavy grocery bag), one carries its full weight. One can also stabilize an undertaking by centering it as a priority or embracing it more fully, holding it closer to heart (e.g., more tightly embracing a heavy grocery bag to ensure its safe delivery). We argue that to entrepreneur, then, is to *take upon*, to accept and prioritize a challenge connected to specific responsibilities and risks. Samuel and his peers did this when they applied their critical understandings of the world's unjust power-structuring to their engagement in STEM-rich maker practices in their community. As we reveal in this manuscript, Green Club members held the weight of their neighborhood and peer community's concerns to their hearts, taking up specific challenges and using making as a tool to address them. They were carrying out processes of innovation to meet identified needs. Even before entering a traditionally defined entrepreneur community, they were engaged in legitimately entrepreneurial forms of action, co-constructured in critically oriented ways through STEM-rich making.

However, how youth of Color growing up in low-income communities are supported as legitimate, contributing members to a local maker-entrepreneur community is a contentious process rooted in historical injustice. While we move forward with using the terms maker and entrepreneur, we remain critically cognizant of the dominant narratives seeking to severely limit accepted definitions of what it means to be an entrepreneur (Ogbor, 2000). As we show in this paper, the neoliberal entrepreneurial stance elevated jointly by STEM and the maker movement works against justice-oriented efforts to undertake and promote disruptive innovation, often in insidious ways that necessitate coordinated confrontation and structural critique. While Green Club members held sophisticated understandings of what critical and community-centered orientations toward entrepreneurial efforts could mean for their STEM-rich making practices, this kind of entrepreneurial identity work was not automatically endorsed at their local Faire. We study how youth navigated this process as a critical collective of innovators, asking the following questions:

- How do youth critically engage with and redefine entrepreneurialism through their identity work during justice-oriented, STEM-rich making?
- What tensions emerged through their critical enactment of discourse and practices?

Systemic inequities, and the twinning of entrepreneurialism and making discourses

Entrepreneurialism/entrepreneurship, the process of "perceiving opportunities and … [creating] organizations to pursue them," has been celebrated as a primary source of economic growth (Bygrave, 1993, p. 257). At the same time, the maker movement (and especially making which is tech-heavy and STEM-rich) are prized sites of entrepreneurialism, with attention to innovations that solve problems. With creativity, intuition, networking, and hard work, proponents explain, both innovation and profit are possible (Hatch, 2013). Such sentiments call upon a neoliberal entrepreneurial stance, that is, a "model of innovation heavily tied to marketization and commercialization" and characterized by individualism, economic competitiveness, and self-profit (Rhoads, 2018, p. 11). The discourses of making and neoliberal forms of entrepreneurialism have been twinned, amplifying each other.

As the makerspace movement gains momentum globally, a primary tenet centers on empowerment through the re-creation of one's own world through individual manipulation and control of that world within makerspaces (Doughtery, 2013). The maker movement, in foregrounding neoliberal entrepreneurialism, is solidifying a culture that accents the commercialization of innovation, including attention on patents, licensing agreements, copyrights, and start-ups (Kleinman et al., 2013). This confluence of commercialization and democratization produces a site of tension for youth who are still developing a sense of what the world is and how humans and human-mediated systems fit together through daily processes and practices of power. As Rhoads (2018) argues, neoliberal entrepreneurialism inhumanely places "corporate profit and greed over the needs of people, including the goals and objectives of organized labor" (p. 12).

While attention on neoliberal entrepreneurialism has focused on labor, little research has *unpacked the discourse of entrepreneurialism as an object of maker learning*. The entrepreneurialism inherent in the maker movement is anchored in neoliberal tropes, thickening a maker culture that is oriented toward global capitalism rather than one that could "democratize STEM." Indeed, as Ogbor (2000) states, "the concept of entrepreneurship is discriminatory, gender-biased, ethnocentrically determined and ideologically controlled, sustaining not only prevailing societal biases but serving as a tapestry for un-examined and contradictory assumptions and knowledge about the reality of entrepreneurs" (p. 605).

Due to limiting historical uses of "entrepreneurship," some have proposed the idea of social entrepreneurship as an alternative. Social entrepreneurship is framed as "ethically and socially inclusive" forms of capitalism (Dacin et al., 2011, p. 1204), which includes either donating proceeds of entrepreneurial work to social causes, or incorporating a social mission to

one's business model, such as hiring local workers in economic need (Ruskin et al., 2016). However, the field has not solidified on a shared view of who or what the *social entrepreneur* is as an identity-in-practice, although there are dominant themes. For example, the social entrepreneur literature is replete with narratives of the "heroic individual" who changes the world (Dacin et al., 2011), taking an individual analytic lens with limited attention to how context and social dynamics shape social agendas and practices (Van Wijk et al., 2019). Further, social entrepreneurialism is attached to the market economy, rather than on innovations that help to create new social futures, with few exceptions. One notable exception is the work on social innovators and disruptors. For example, Huq (2019) describes "social disruptors" as those who seek innovation through disrupting ideas and actions that question established routines and ways of addressing complex problems.

The maker-entrepreneur

The recent equity-oriented literature in maker education is an interesting context in which to make sense of entrepreneurialism because of the tensions in values espoused by the dominant neoliberal agenda and growing concerns in making focused on the community well-being. A growing body of scholars have documented how the emerging field of making shapes how youth of Color are either welcomed into or sidelined from making (Brahms & Crowley, 2016; Calabrese Barton & Tan, 2018). As making grows into its own field, the norms, discourses, practices, and epistemologies of making are becoming settled to some extent. Market-driven perspectives on and practices of making have been conceived through dominant ideology, focused on the contribution to markets, but not to the well-being of people and communities (Vossoughi et al., 2016).

While this literature has not directly taken up the intersections of neoliberal entrepreneurialism and making, there are cautions and insights implied. Take, for example, Kafai et al.'s (2014) work on equity-oriented approaches for expanding access to and participation in e-textiles, a field of making that brings together computational thinking, design, and crafting. They illustrate not only how these hybrid forms of handcrafts engage students in making practices that bridge knowledge of traditional crafts with disciplinary knowledge but also how such work requires collaboration and supports care and friendship building. Bajaras and Bang (2018), in their exploration of indigenous making, take this critical stance even further. Charting four principles of Indigenous making and sharing, these authors foreground the historicized dimensions of making practices in ways that center family/community along with social and ecologically just nature–culture relations. These frames for making promote

a much different vision than the individualistic, self-driven, and controlling practices of neoliberalism.

Even if social dimensions are explored as a part of the processes of making, they may not extend beyond valuing personal choice, denying the collectivist nature of problems faced by humanity. They may also not attend to a critique of the social structures which keep the fields of making and neoliberal entrepreneurialism in place as they are. As youth of Color engage in STEM-rich and entrepreneurial making, they are faced with the task of navigating inequitable social structures that shift how both STEM and maker-entrepreneurialism get defined and shaped as opportunities.

Consider Keke and René, two Black teenage girls who took up STEM maker-entrepreneurialism as an opportunity to address the issue of sexual violence against young women of Color in their community, when they designed an anti-rape coat in their STEM makerspace (Greenberg & Calabrese Barton, 2017). As the girls explained, they wanted to leverage their STEM-rich making to reach "other girls like us" in "our community." They invited peers into their community makerspace to crowdsource narratives that situated their online and community survey data in local realities for young women of Color. They pulled in friends to help them test alarm noises, design look, and wearability. Their efforts reimagined STEM and maker-entrepreneurialism as sites of active resistance against violence toward a regaining of voice and power. This was social entrepreneurialism of a different kind, a complex, intersectional engagement for community justice, an entrepreneurialism critically redefined as enterprising innovation for the purpose of contributing to social transformation.

However, the fairly significant "absence[s] of conversations about race and equity" in makerspaces and STEM education allows for racialized inequities to be normalized and reproduced (Nasir & Vakil, 2017). This discursive vacuum perpetuates continued arguments for market-driven individualistic forms of making. Yet, any innovative practice is "always in dialectic with the dynamic culture that surrounds it," and is thus interwoven with social, racial, gendered, economic, and political conditions in which particular makers are bound, and the norms, values, and social impacts connected to these questions.

We take as a starting point the critique that both neoliberal entrepreneurialism and STEM-rich making have been driven by historicized power inequities enacted in-practice through hegemonic masculinity, whiteness and middle-class values, discourses and practices. Engagement at the intersection of these domains, whether it be formal or informal, educational or professional, is dangerous territory for those who do not fit these norms, or who wish to foreground goals different from the overt elevation of marketization and commercialization.

Looking at STEM-rich making through this complex lens of critical justice reveals that who can make what, and through what types of access

points, is structured externally and connected deeply to a history of injustices that position and constrain youth efforts differently based on race, gender and sexuality, class, and other matrices of oppression and privilege. At the same time, it acknowledges how makers can be co-constructors of culture, engaged in a mutual activity that challenge normative views of knowledge production and expertise. Opportunities to innovate can be mediated and constrained by inequitable structures of power that work to reproduce injustice rather than address and ameliorate it. But opportunities can also be created through, and informed and expanded by, young people's diverse interests and the historicized practices of communities of Color's rich and legitimate resources for making (Tan & Calabrese Barton, 2018).

Youths' identity work as community justice-oriented, critical maker-entrepreneurs

The youth in this study were long-term participants of a community-based, weekly STEM-rich making program. Some, like Samuel, have been actively involved in the program for over six years; others had at least two years of continuous, weekly participation. Youth engage in a process of learning and becoming as they engage in both STEM-rich making and entrepreneurialism. Issues of identity—and how one positions oneself (or is positioned) through practice and discourses—are central youths' maker learning. We view identity as fluid and constructed socially within communities-of-practice (Holland et al., 2001). Upon entering a community-of-practice such as a STEM-rich makerspace, youth develop identities through engaging with the discourses and practices of that community. Maker learning becomes a process of coming to be or identities-in-practice (Holland et al., 2001).

Through work in community spaces, studies show how youth, across space and time, engage in identity work that opens up new discourses on making (Calabrese Barton & Tan, 2018) and on what it may mean to become a valued and successful maker (Bonnette & Crowley, 2018). When youth are supported in engaging "problems rooted in everyday experiences," for example, they can co-opt available discourses and practices toward reorganizing STEM expertise (e.g., Nasir et al., 2006). Given that making and entrepreneurialism are built on the ideal that the high-tech nature and work of such spaces are ever changing, this stance is even more salient (Gill & Larson, 2014). In our work, we refer to the *active* dimension of youth co-opting discourses and practices toward desired goals as identity work. These in-the-moment, socially negotiated decisions and actions are both grounded in who youth are and who they desire to be, while also tethered to historical, cultural, and social norms governing particular spaces (Tan et al., 2013).

Identities-in-practice are stabilized when more powerful others, across space and time, recognize and validate particular practices and discourses one is authoring (Van Horne & Bell, 2017). Similarly, identities-in-practice can be destabilized or erased, when recognition is continually denied (Allen & Eisenhart, 2017). Such efforts can be both a form of oppression (e.g., a teacher not recognizing a student of Color for their technical expertise) or an act of resistance (e.g., youth refusing to recognize particular identities-in-practice as legitimate; Sharples, 2017). One can also resist the efforts of others to either foist an identity-in-practice onto one or to elide an identity-in-practice one considers germane to oneself (Yoon, 2012). These individual-social negotiations of performing and soliciting for recognition for who one is and can be, are the substance of engaging in identity work (Tan et al., 2013).

Considering how people engage in identity work as a part of making and entrepreneurialism challenges researchers to consider how people draw upon a wide range of repertoires of practice as they move across different and often new settings (Gruen, 2018). Maker settings and practices promoted therein can offer youth spaces to co-opt extant repertoires and discourses toward powerful identity work related to who can be a maker and for what purposes. Such studies challenge the tightly linked discourses of entrepreneurship and innovation in collaborative co-making and co-working within making spaces (Mitev et al., 2019).

Method

Critical ethnography

Our study was carried out over a two-year period as a critical ethnography —a justice-oriented methodology, which has an explicit focus on participatory critique and social transformation. Grounded in the belief that relationships among actors and the social structures through which they act are never neutral, critical ethnography foregrounds the ways in which relationships are shaped through power and oppression. Tools of ethnography are used to conduct empirical research to examine and transform inequalities from multiple perspectives (Trueba, 1999). This approach was important as we attempted to make sense of how youth, who are positioned in particular ways due to race, gender, and class, engage in makerspace activities.

Youth participants and context

This work took place in a making space program located in a community-center in Great Lakes City, a mid-sized city in the upper Midwest. The

community center itself has a focus on youth development, homework help, and sports for youth from low-income backgrounds.

Youth participants

Twelve youth participated in the Faire, and as co-researchers in this study (see Table 2). Youth were known throughout their community as STEM experts through their membership in "Green Club," a year-round program that facilitates STEM engagement in and with community for youth in the middle grades (ages 11–14) through STEM-rich making experiences. Founded in 2007, this program has run continuously for more than a decade with the same researcher-practitioner founder (the second author) still present as participant, mentor, designer, teacher, researcher, and friend (and the first author, continuously, since 2013). The program is anchored in an authentic long-term, critical participatory partnership that seeks justice with youth and community in and through STEM-rich making. Youth have kept strong relationships with program staff throughout this decade, becoming teen mentors, using recommendation letters and advice toward college navigation, and visiting/volunteering periodically. The year of this study was the first time that any Green Club members had entered their work in an entrepreneurial fair, but in years past, members had submitted their work for other competitive events, including a local news station's public service announcement competition, and a regional energy company's green energy design contest.

Green club

Youth participants work with researcher-mentors to leverage their funds of knowledge and connections to community resources as central to the work of community-engaged scientists and engineers. We sought to resist neoliberal entrepreneurialism in program design and its overt elevation of marketization and commercialization as it stands in contrast to the justice-driven perspective youth brought to innovative design toward social change-making. As noted in the timeline below, the STEM-rich maker work youth took up was oriented toward the new social worlds their artifacts may help to co-produce. For example, when Green Club member Christopher co-designed an anti-bully app with members of his community, his goal was to elevate conversations on the locations and types of bullying present in his community, and crowd-sourcing locations of bullying and strategies for action-taking (Calabrese Barton & Tan, 2018), not in marketization and commercialization. While issues could be addressed by powerful others with different means (e.g., hosting a city workshop on bullying), the point of Green Club work was as much about co-opting making with a critical lens toward co-creating a world where their ideas, community wisdom, and maker expertise mattered toward community well-being (Calabrese Barton et al., 2017). Youth were not

expected to fully solve community problems wrought by systemic violence and perpetrated by an oppressive system, but rather they were supported in engaging in the world of STEM-informed innovation in ways that did not seek to silo innovation away as separate from community life. This making framework offered youth spaces to acknowledge and examine real contexts of life instead of expecting them to bracket it out (e.g., app design can embrace community wisdom on defenses against bullying; lived experience can be honored as a resource for technological development). Layering critical maker-entrepreneurialism as a new lens for considering youth engagement in our maker program can help us understand how youth are already using maker tools in enterprising ways toward a re-designed world.

Timeline of events

Investigating community concerns (October–November)

Youth engaged in community ethnography and systemic reflection on personal experiences to identify, delineate, and seek feedback on problems they wished to engage through project work in their makerspace.

Building, testing & refining prototypes (December–March)

Youth conducted research on possible design solutions, which included both online research, and data generation in their local contexts (e.g., interviews, observations). They created 2-dimensional and 3-dimensional plans for building designs to address the co-identified concerns and sought feedback from community members on their plans. They prototyped working versions of their designs, with input from community members as they engaged in design testing and refinements. These designs were meant to serve as tools that would foster new social relations. They were not market-oriented designs that promoted a commercialism in as much as they promote dialogue on potential new social futures.

Making a decision to join the Faire

Green Club youth had seen flyers at their schools for the Faire, and a Green Club mentor had also heard about the city-wide event from university colleagues. Youth had been lobbying us for a while to seek out more public competitions to showcase their work and gain recognition and prizes (such public opportunities for recognition were inconsistent but the subject of much youth interest). So one of the Green Club mentors contacted the Faire organizers to get more information. The Faire usually attracted attendees from school entrepreneurship programs, and we had not considered our program one of entrepreneurialism. But organizers assured us in an e-mail that this event could support youth in building new social networks as well as be a place to showcase their work to a much wider audience across the city. As stated in

mentor notes taken during a following in-person meeting with Faire organizers: "Projects need to show innovation and a contribution to the community. No need for 'for-profit' approaches. [Organizer name] noted how important it would be to have youth's technical expertise showcased at the event."

As we debated the merits and tensions of attending (see Table 1), we considered that building social networks and broad exposure could push back against the structural inequities that prevent lower-income youth of Color from gaining such social capital. Green Club youth also persistently reminded us that they deserved access to the large cash prizes the Faire advertised. Ultimately, Green Club members and Faire organizers persuaded mentors that the potential benefits were compelling enough to support youth desires to enter the Faire.

Authoring business plans/applying to the Faire (February)

When the mentors agreed to bring youth to the Faire, they learned that youth needed to write up a two-page business plan. This was a tension for the mentors because they had not conceived of the making work with the youth as being about a business. However, the mentors also believed that the youths' design work was amazing, and deserved recognition by the broader community. Thus, youth authored 2-page (650–800 word) business plans, co-opting the template required by the Faire in order to serve how they wanted to define and represent themselves and their design work. The categories presented in the Faire application included problem, solution, marketing plan, financial plan, competition, and next steps. Notably, both youth and mentors struggled with producing this plan. No one in the makerspace had a "financial plan" for their projects. Mentors and youth laughed and struggled with the incompatibility of explaining a financial

Table 1. Youth and adult debate points on the merits and tensions of attending.

Reasons to Attend	Reasons NOT to Attend
• Build social networks and learn about new possibilities for youth-led collaborative efforts in/across the city • Broad youth exposure and recognition in a new professional sphere • Felt confident based on reading about previous years projects, that GC youth had technically advanced projects • Fun/entertaining field trip event • Celebrate youth accomplishments on-stage • Youth had lobbied us to seek out more public competitions to showcase their work and gain recognition through prizes	• Green Club is not a "business club" like some of the other youth groups competing • The business plan requirement did not match our community justice-oriented vision or goals for our STEM making program • Worried about being only middle school and out-of-school program attendees • Worried about how homogenous the organization could be, and how this would position youth of Color

plan for a not-for-profit business. As aptly put by the makers of an online app for sharing information about homelessness in their community:

> The app is free because we want to make it so that anyone who wants to help out is easily able to access it. It's very important for apps to be free … Our plan is for justice and helping the community, not for business-as-usual while people starve and sleep in the cold. So, we will keep our app free for the public to access the information they need to help their fellow community members.

Presenting at the fair (March)

Youth constructed presentations (PowerPoint slides and table visuals) to share their work. One day in March, youth spent 4 hours standing by their projects, engaging in dialogue with visitors and judges.

Youth roles

Youth assumed multiple roles throughout their engagement in their maker-space, being actors in their own STEM-rich maker investigations and projects while also having input on the direction of this particular study. In weekly conversation groups, youth identified topics they wanted to discuss related to our work in making together, and also provided critical feedback on what tools and resources they wanted more of in their maker-space. In fact, this particular study grew out of one of our conversation groups, where the youth strongly critiqued their experience at the entrepreneurial fair. They named the desire to have their voices more fairly heard both within the entrepreneurial community, but also in a way that could transform that community. This is one goal of our project together.

Nevertheless, the overt STEM-rich focus of the program and the decision on the part of the mentors to accept an invitation to an Entrepreneurial Faire can be fairly critiqued. It is our goal, in critically engaging the events, as they unfolded, and their implications, in this manuscript, that we tease out these complicated layers of both hope and concern. The routine ways in which a neoliberal entrepreneurial agenda makes its way, even into justice-oriented making work, need to be understood.

Our roles

In our dual researcher-teacher roles, we collaborated with club staff to establish the making space program. During the year of this study, the program focused on STEM-rich making as a form of science and engineering for sustainable communities that incorporated community ethnography as data collection and ongoing community feedback and support through their design processes. The program ran weekly during the academic school year.

Because we drew upon critical ethnography, we engaged in research "with" participants, rather than "on" or "for" them. In as much, we assumed multiple roles acting as teachers, mentors, and researchers. This positioned us as

members of the group who had various degrees of influence on the direction of inquiry as the investigation progressed. For example, at the beginning of each school year, the first two authors co-designed initial whole-group activities around defining a problem space as a way to support youth in naming issues that they care about—one initial way to legitimize these concerns in their makerspace. We also worked with youth on developing their maker projects to be shared with an entrepreneurial community. This involved considering what problems they were solving, how they identified these problems, and the roles their projects played in addressing them. The third and fourth authors, who themselves have experiences teaching and researching in similar informal science programs, co-analyzed the data with us, offering an outsiders' point of view, opening up new insights into the data and claims.

We approach this work, knowing that our positionalities lead us to have only partial understandings of the knowledge, practice, wisdom, and experiences of partners, particularly with regard to issues of racism, classism, and sexism. The voices, experiences, and lives of those silenced by institutions need to be at the research and development table to authentically inform a contextualized equity agenda. This point furthers our desire to engage in participatory approaches and speaks to why we have also sought to engage in this work in deeply entrenched ways. The first two authors, both directly involved in data collection with the youth in this paper, have spent time weekly in our partner space over multiple years to build the kinds of relationships needed to engage justice-oriented work across positionalities and perspectives. The second two authors have spent significant time in their own afterschool STEM-rich making partnership spaces in low-income communities, bringing those sensitivities to bear on this particular analysis. In terms of demographics, the first author, who identifies as White and female, grew up with food stamps, housing evictions and transience, parent bankruptcies, and violence-related trauma while attending a private religious school as a "scholarship kid." She was conditioned in the tension of hiding her home realities to fit into school and social norms of middle-class Whiteness and femininity, while continually confronting imposter positionings across learning events and spaces. Her lived experiences led her to recognize complicated nuances of intersecting forms of injustice, such as continuously being handed unearned privileges due to her skin color within racist structures of practice while simultaneously being categorized as not belonging in particular spaces of power due to class and gender stratification. The second author, who also identifies as White and female, grew up in a working-class community, where STEM learning opportunities were limited to what her local public school offered as part of the standard curriculum. While having the freedoms inequitably granted upon her for being White in American society, she also experienced the societal-imposed limitations of attending under-resourced public schools and being a female

in STEM. While finding excitement in informal explorations of STEM at home, she also experienced having to "give up" part of her identity to be considered scientific in school settings. The third author identifies as an ethnic minority person who experienced marginalization as a South-East Asian immigrant in the U.S. and as one of only two females in a university science research laboratory. The fourth author identifies as a White, middle-class woman who studies spaces of science practice as a highly socially privileged outsider due to a lack of formal training in science. These differently nuanced experiences of our own positionings within matrices of power and oppression have informed our continuous, collective engagement, together and with valued partners, in anti-racist and anti-classist research and practice. These experiences have helped us to more critically examine how people are positioned as insiders and outsiders to STEM and making through both sociocultural and institutional structures and in local practice.

Specific methods

Data were generated from 2015 to 2017 from artifacts, weekly youth conversation groups, and video analysis capturing youth interaction with STEM and community experts at various stages in their design process. Detailed field notes of twice-weekly interactions with youth were kept during the maker programs by more than one researcher to allow for multiple perspectives. We conducted mid-year and end-of-year "artifact interviews" lasting about 90 minutes per youth/team, and covered four categories of questions: a) Understanding the artifact (what is it, how it works, what problem it solves, materials used and why, etc.); b) Participation and engagement (behind the scenes, including a step-by-step description of the process of making, along with descriptions of interactions/support youth received from peers, educators, and community members, resources used); c) STEM Knowledge and practices, and funds of knowledge; and d) Meaning and value (what this project says about oneself, etc.). We conducted Entrepreneurial Faire Interviews (on-the-spot and more formally afterward). In addition, we held informal weekly conversations with a subset of youth during event preparation and afterward focused on what this event meant to them. Lastly, we collected all youth artifacts produced, including research and design plans, images/videos of prototypes, business plans, and powerpoints/posters created for the Faire.

Data analysis involved multiple stages and levels of coding based on procedures for open coding and method of constant comparison (Strauss & Corbin, 1998). The first pass involved reading through entrepreneurial event conversation and artifact interviews transcripts as well as our fieldnotes kept during the Faire and during the course of youth maker project work. The goal was to surface points and open codes of a) tensions and connections among

the various youths' forms of engagement in making/entrepreneurialism (e.g., enduring struggles), b) critical design moments (e.g., sticking points, changes in direction, etc.), and c) generally how youth talked about and framed what it meant to engage in STEM-rich making with and for community, and how these narratives reflected their ongoing identity work as justice-oriented community youth makers. For example, in trying to open code for critical design moments, we noted times when youth made shifts in design, became deeply frustrated or disengaged, or otherwise noted (e.g., during artifact interviews) when they felt had important turning points. A detailed list of emergent open codes was kept with analytic memos.

Our second pass involved analyzing emergent codes through the lens of how youths' actions and reflections about their experiences at the entrepreneurial fair signaled particular aspects of their continued identity work: How they were resisting specific narratives of neoliberal STEM entrepreneurialism that were in conflict with their justice-oriented community youth-maker identities; and how they were enacting particular practices true to being justice-oriented community youth makers that disrupted established norms at the entrepreneurial fair. We sought to understand what these codes revealed about the tensions that reside in the conflicting ideologies. By examining dynamics within moments of identity work in specific contexts, we started to see how who is valued and called legitimate in different spaces and moments of making holds real consequences for what becomes possible in those spaces and moments, directly impacting youths' identity work as maker-entrepreneurs. We then developed the term "critical maker-entrepreneur" in a final round of analysis, in response to how youth positioned their maker engagement as a legitimate part of an entrepreneurial community. Layering critical maker-entrepreneurialism as a lens helped us to understand youth action in more complex ways. This analytical approach pulled in ideas about identity work, including knowledge and practice development, recognition, and action-taking, that youth took up and leveraged across their engagement, for particular purposes related to their goals of creating change in business and in STEM.

Findings

Green club members as critical maker-entrepreneurs: Practices, discourses, and tensions

> *"Helping our community is helping us, too. It's not just helping one person. It is helping everybody."*—Samuel, age 14

Youth engaged in multiple dimensions of re-humanizing and community-grounding their making toward becoming "critical maker-entrepreneurs" in practice. First, youth engagement in critical maker practices multidimensionally centered youth knowledge and presence. These practices were mediated by

attending discourses as youth sought to enact them, collectively, across settings. We show how engaging in practices and discourses toward a critical maker-entrepreneur-in-practice opened up and problematized the assumed neoliberal stance often associated with entrepreneurialism, including social entrepreneurialism. We also show how these practices and discourses led to critical tensions as youth sought to make their identities matter at their local Faire toward enacting and promoting a new, more critically informed social imaginary for a more critical maker-entrepreneurialism (Figure 1).

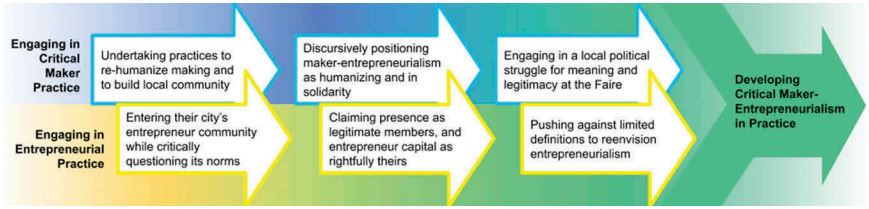

Figure 1. Conceptual model of a youth-led effort to construct critical maker-entrepreneurialism.

Maker-entrepreneur practices: Making for community well-being and justice

Green Club members' making was grounded in multiple and intersecting practices that defined and expanded their work. Two practices were shared across projects in this study: a) re-humanizing making and b) building community. These practices grounded youths' engagement in the forms, processes, and outcomes of making and entrepreneurialism. The practices also guided Green Club members' public projections of what making and entrepreneurialism could be, do, and/or produce. This informed their identification of problems and the prototyping and communication of solutions, as well as a spectrum of embedded practices youth enacted that expanded those two traditionally recognized STEM-rich making dimensions. It also informed their engagement in asserting the legitimacy of their active, vocal presence within structures of making and entrepreneurialism designed to ignore or suppress that presence.

Re-humanizing making

Youth centered community members in their work by paying attention to what positioned themselves and community members as less than fully human because of their race, class, and gender. All five groups of youth sought to trouble these dynamics through practices that refused and rejected such structures of de-humanization. Here we draw upon

Afrocentric thought to frame de/re-humanization. Harvell (2010) describes humanization as an Afrocentric liberation discourse grounded in the struggles of Black people, and which centers the moral and social benefit and dignity of a community as a whole rather than the individual.

In different ways, the five youth groups critically questioned how socioeconomic structures of pay-for-basic necessities created unequal access to health and well-being, educational opportunities and resources, and safety. For example, the "Timmy" group, comprised of three boys (though they gathered continuous input and assistance from at least nine other boys who played basketball with them), was interested in becoming shoe designers sponsored by a large brand like Timberland or Nike. They followed celebrity-athlete trends in mass shoe design consumption and connected their project engagement to possible futures in the athletics design industry. But they were also concerned about the risks of frostbite for people who could not afford high-insulation shoes. This was a real issue to the youth. They talked about experiencing pins and needles (which they also called "itchies") when their feet were too wet and too cold for too long, or how it had felt as if they were walking on numb "stumps" after playing outside for too long in the wrong shoes. As Maken noted, "Sometimes my feet get so cold, they feel numb—so you have to itch your feet to get the numbness out. In the wintertime, boots keep snow out. They keep snow from getting into your shoes. They should be waterproof, and they should be high quality." An important issue tied to an inequitable economics-mediated life in a Northern climate, these boys noted that caring for feet was an important health and safety issue, both of which ranked high on their survey data from 119 community members. While all group members owned protective winter boots, they remained alert to the potential needs of others and were interested in undertaking this issue as a making challenge. This group also discussed specific cases of high risk for feet that they had observed throughout their community, including a classmate who had a large hole in his winter boots, a peer with a broken ankle and open-toe cast, and community members they often encountered on walks to/from school whom they knew to be homeless.

In another example, the "Warm Your Bodies" group focused on the importance of the humanizing dimension of caring about the challenges of community. Noting that the majority of riders on their bus route were people of Color, the girls wondered why attention had not been paid to the challenges bus riders have. They also noted that their quadrant of the city, home primarily to communities of Color and lower-income communities, had fewer bus routes. Centering their project on the needs of riders who likely experience greater impact of waiting in the cold was an act of rehumanizing the bus-riding experience. As Amara further noted, she knew firsthand that the bus seats were uncomfortable, especially if you had to ride a long way. She explained that

this knowledge shaped her project, along with the stories she heard about the bus riders' challenges from her mom, a bus driver: "I get on the bus enough to know. I see it every time I get on there … Plus I hear my mom talk about a whole bunch of stuff that be happening on there … People are very dependent on it. The stories I've heard."

The DIY Video group considered humanization from the standpoint of being recognized for who they are in the world. They explicitly stated that their videos were "For Us By Us"—in an effort to ensure that digital making resources showcasing youth of Color and girls were available broadly, thereby changing the imagery of making from one that is predominantly White and male.

One important aspect of rejecting structures of de-humanization was the act of sharing dignity and care. As Jazmyn noted, "we care about each other" and "we are here because we want to try to make things better." This practice took form in both explicit and nuanced ways across the groups. For the Timmy group, this looked like inserting a rechargeable heating element into the sole of a Timberland-type boot to turn their rejection of dehumanization into action for dignity and care of community members and their bodies. Beyond addressing vulnerabilities of weather exposure, the group took another step to address their community members with respect for the social dynamics mediating what people wanted to place and display on their bodies. Peer-sourced data had informed their design criteria, deeming a Timberland-type boot to be situated at the intersection of socially desirable/fashionable and utilitarian in its water-resistance and durability.

Building Community

Youth centered both community wisdom and historicized injustices in their efforts to leverage critical maker-entrepreneurialism toward social change. In particular, we see this practice as a deeply grounded in Black epistemological practice, described by Morrison in *Beloved* (2004) as involving a sense of survival, affirmation, and feeling whole, all while working to make sense of and disruptively repair historicized injustices. First, similar to findings from other studies (Bajares & Bang, 2018; Calabrese Barton & Tan, 2018), youth's maker-entrepreneur practices were rooted in a deep *knowledge of* and an *historicized presence* in their communities. Their making efforts were informed by the lived experiences of community members they had relationships with. For example, Fall and Samuel both described their work as involving months in and with members of their community figuring out what problems or questions real people in their community had. These two youth created a multi-layered GIS map of library locations, hours, bus routes and times, and neighborhood distances. They interviewed community members on their desires and needs for books and materials. As indicated in Table 2, all Green Club youth involved in the Faire sought

Table 2. Youth making practices in community and in historicized context.

Project (designer)	Community Issue [I] & Prototyped Solution [S]	Connection to Historicized Injustices
The Timmy (Malik and Cory)	I: Access to appropriate footwear in cold Michigan winters. S: Developed a heated boot to sell for a high price, but be free to people who are homeless.	Resource level for purchasing clothing and footwear stratify community residents in Northern climates in unjust, dangerous, and potentially life-threatening ways.
Little Free STEM Library (Fall and Samuel)	I: Access to libraries, STEM-based fun books, maker supplies. S: Built a three-shelf structure with solar panel lighting, STEM-focused books, and little "maker kits".	Access to knowledge is not democratized in traditional library structures (e.g., fees deterred youth from borrowing). Libraries are also not physically accessible, being located far away across their town.
Warm Those Bodies (Keke and Amara)	I: Waiting for public transportation is dangerously cold in the winter. S: Developed a sustainably powered heated shelter and bus seat cushion two-part system.	Access to basic necessities of warmth and shelter during necessary cross-city movement (e.g., for jobs) are limited to residents who own cars.
The No Home Phone Button (Jazmyn & Iyanna)	I: Many kids stay at home when parents work. Fewer and fewer families have home phone lines. Kids often only have smartphones without phone plans. This is dangerous in emergencies. S: Modified desk alert designs to create an Arduino button-triggered alarm.	Access to emergency services is mediated by family resource level for not only phones, but prohibitive-cost phone plans.
DIY Videos (Thomas and Tara)	I: Many "how to" STEM/maker web videos feature white, middle-aged men, aren't meant for kids to understand, and don't welcome youth of color or girls. S: Developed a video series featuring green energy sources being used in their makerspace. Made sure they were "fun" and expanded ideas about who could "do" this kind of work.	Representations of scientists and engineers on YouTube, a platform with potential to disrupt power hierarchies and democratize access to STEM learning and practice, still follow the dominant paradigm structuring STEM engagement for white males first.

to solve community-identified problems related to specific community needs, such as the need for warmer clothing and shelter in the winter months (e.g., the Timmy, Warm Those Bodies), greater access to safety (e.g., No-Home Phone, the Timmy, Warm Those Bodies) and education (Little Free STEM Library, DIY Videos). These problems were identified through surveys and interviews with community members, but also reflected youths' own experiences in the world. In crafting interview and survey questions, mentors helped with organizational and technical suggestions, such as how to order the interview questions that youth came up with, and showing youth how to create a survey with the platform survey monkey. What questions to ask, and possible follow-up questions in face-to-face interviews, were almost entirely provided by youth. When analyzing survey data, mentors acted as guides in making meaning of descriptive statistics autogenerated by the site SurveyMonkey but took a back seat when it came to conjectures about the patterns data might reveal about community concerns.

We view this practice as an effort to collectively center community wisdom while also naming challenges, often local forms of systemic injustices, that young people encountered on a regular basis. Asking direct questions such as "How has racism affected you?" (Thomas & Tara) and "How can your community be happier? Healthier?" (Keke & Amara) on the surveys they used, youth promoted dialogue on problems that went deeper than just a simple want or need.

Inclusion of community perspectives extended beyond the initial problem identification as youth sought a wide range of inputs in each aspect of the design process. For example, after the initial survey to identify common themes related to community concerns, youth were supported by mentors in incorporating other types of smaller-scale surveys, observations, and interviews to gain information and/or input on specific aspects of their designs. Consider Amara and Keke, who prototyped the "Warm Those Bodies" heater system. These young women surveyed riders on the bus and at bus stops to learn more about whether they wanted a warming device and if so, what qualities they would be interested in. They also recorded how many people rode their bus route, how long they waited at bus stops at different times of the day, noting temperature and how people felt. The Little Free Library designers solicited input on the types of books people wanted to see in the library, and whether their plans for book checkout and return were clear and easy for community members. As Fall noted, "We have to have books with different reading levels and some with just pictures because even five-year-olds said they wanted to use the library."

Youth practices of building community attuned to and leveraged nuanced understandings of multiple dimensions of historicized injustices

experienced in and across their communities. For example, the DIY Videos group attended to dimensions of gender and racial injustice in online media representation, intersecting this with an attendance to the need for a critical youth-lensing of adult-dominated DIY video production traditions. The group's multidimensional engagement in maker-entrepreneurialism rejected dominant power structures that had supported White, male adults to produce content peers in their schools and community center described as insultingly "boring" due to reproducing stale, hegemonic styles, and storylines. These understandings of multiple types and layers of injustice informed their definitions of the practices and products of making that mattered both at the local level, and more broadly.

Below (in Table 2), we lay out specific youth-authored local practices within each group toward solutions to local community issues the youth had observed and analyzed. In the next section, we connect these small-group efforts to historicized injustices reaching across scales as structured systemically and experienced locally.

Expanding maker-entrepreneurial reach: Mediating discourses and leveraging action

In the previous section, we discussed how youths' maker-entrepreneur practices were rooted multidimensionally in ways that centered their community knowledge and presence. These practices were mediated and informed by different community discourses as youth sought to enact them collectively across settings. For example, the Timmy group's athletic and celebrity fashion interests came into contact with community safety concerns in winter, shaping their ideas about undertaking a human equity concern while honoring peer-community repertoires of esthetic consumption, through critical maker-entrepreneurial engineering design. Of particular focus is how these mediating discourses took form when youth sought to expand their reach beyond their local community and into the local entrepreneurial community. Below we describe two attending and intersecting discourses that youth took up toward foregrounding their practices and restructuring the space of entrepreneurialism: a) positioning maker-entrepreneurialism as a humanizing act, and b) building solidarity across community.

As youth entered the main Faire event, their histories-in-person as critical makers in and with community came into contact with structures of practice and discourse that had traditionally held all the power in their city's professionally recognized maker-entrepreneur spaces. The meeting of their alternative forms of practice and discourse with the discourses and practices of traditionally recognized entrepreneurialism created a particular space of political struggle that we explore below. As two different and conflicting

histories collided that day, new practices regarding critical maker-entrepreneurs, which foregrounded explicit political critiques of capitalism, began to emerge that disrupted traditional structures of power across communities of practice.

Discursively positioning maker-entrepreneurialism as humanizing

As a first step for gaining entry into the Faire, Green Club members prepared business plans, as required by Faire organizers. Event organizers presented a format to follow, which included eight categories of responses:

1) Describe the problem.
2) Describe the solution.
3) What is your target market?
4) How will you market this?
5) Please share a financial summary.
6) What is your competition?
7) How is this good for the [Great Lakes City] region?
8) What are your next steps?

In examining the event-required sections to include in their business plans, youth indicated that these plans did not "fit" the complexities of their STEM-rich practices or who they were as critical makers in and with their community. As one youth maker, Tara, indicated, "We don't think about competition. I mean, like, the more resources out there, the better. We're just trying to address a need we identified. If other kids did the same thing, too, it would actually be all-around better." Likewise, Fall noted that "I don't get why they say 'market' (air quotes) your project. It's not like we are selling it. OK, so we gotta get the word out, but that's not like 'marketing.'" As the youth alluded, such categorical titles called up and politically critiqued assumptions about what entrepreneurialism looks and feels like, who can engage with it, who can benefit from it, what determines legitimacy, who is implicated/impacted by it, and how.

In their business plans, youth strongly emphasized the nonprofit dimensions to their maker efforts, along with a community justice focus which foregrounded the practices noted above, re-humanization and community building. For example, the Timmy group developed a plan that described their problem and solution and why it mattered to people in their city in 694 words, but how they would market their invention and their financial plan consisted of 137 words. In addition to length, the depth and substance differed as well. This pattern was true across all of the project written business plans. Tara, from the DIY Video group, noted likewise in her interview, "The reason we're putting our videos on YouTube is because that way everyone can get them for free. They can help anyone."

Through their business plans, youth brought their ideals about community justice forward to a new community at a different, broader scale of interaction. However, this process emerged as a political struggle and was rife with conflict. Youth found themselves re-narrating their project descriptions to be able to speak to a community centered around market-based youth entrepreneurialism, while also pushing on market-based assumptions to educate their audience on their community-informed ideas about what the future could look like. For example, they co-opted some of the terms and categories they were offered toward advancing a justice-oriented entrepreneurial discourse. Several groups used the category "financial plan" to argue why they proposed a nonprofit approach, explaining the urgency behind rejecting a strictly market-based economy as the only framework for entrepreneurialism. Fall and Samuel wrote of the library:

> Our project is meant to be "non-profit." We do not want to make money from it. What we want to do is provide opportunities to the kids in our community, where there are no other opportunities. We know what it is like to not be able to get to the library and not be able to make the kind of inventions that we think up in our heads … We want to bring Green Club and other STEM experiences home to kids, who, like us, know that they can use STEM to make a difference in their communities.

Reaching this decision required youth to make sense of capitalist assumptions, deciding where and how their maker values and goals differed from those assumptions, and agreeing together if/how they wanted to discursively confront these differences. While youth struggled with how to address the request for a financial plan given their focus on community justice as a context for entrepreneurial actions, mentors struggled with how to attend to this struggle. One Green Club instructor noted in an e-mail exchange, "My group wasn't too sure what to do with the financial question either … Their main consideration was for the finances of families who USE the No-Home Phone button (who probably did not have enough money for a phone), not for reproduction or making money themselves." Another sent back, "This justice-related tension about financial[s] is quite strong in most of the proposals." Adult mentors wanted to honor and amplify youth concerns on this point, with a third mentor offering, "Should we send a quick e-mail this weekend to share this issue/concern with [expo organizer], to ensure their proposals get weighed the same by judges as the ones with guarantees of high-profit margins?" Green Club mentors were subsequently assured through further conversations with Faire organizers that the youths' business plans would be valued with their emphasis on nonprofit projects, and that they were excited for their participation.

Here we see the youth promoting a discourse on justice-oriented entrepreneurialism, where social change was valued over market exchange. The capital gained from engagement in entrepreneurialism was the sharing and building of social capital for mutual benefit. This discourse also served as a political critique of the "for-profit" model where wealth is individualized and based upon monetary structures. We see the groundings of youth engagement in STEM-rich making (re-humanizing making, and building community) as forms of shared community wealth.

A political struggle to critically position maker-entrepreneurialism

Youth recognized and defined injustices in structures of interaction dictating which forms of entrepreneurialism received attention that day. They also took action to collectively redefine what it meant to be what we are naming as a "critical maker-entrepreneur." First, many of the youth commented to each other on the monied looks of other student groups (e.g., fresh-pressed suits, ties, dresses, and heels). For example, Tara said, "It's almost like make-believe, or the movies, how all these kids are just looking rich." Second, beyond looking highly resourced, the other groups appeared to be primarily White in racial identity. This entrepreneurial community they had entered was strikingly homogeneous in a racially diverse city. Third, they represented the only group who had arrived without science fair-styled poster board displays. Green Club members had arrived with high-tech digital presentations rich with multimedia (e.g., high-production-value video, photos, bulleted arguments on slides, etc.). Rather than recognize this stylistic practice as an upgrade, multiple individuals throughout the day commented negatively on the group's visuals compared to a carnival of colorful, hand-written posters across the room. Even a city newspaper reporter who had been impressed with the Timmy group and ran a profile on the group's project did not mention the group's high-tech display materials that laid out their design's technical aspects. The article insultingly opened, instead, with a description of their table as lacking in style and flash and implied that the group members did not fit into the expected mold of the day.

Green Club mentors were surprised by the organizers' on-site directions to have their five teams spread across the large convention hall. We desired a collective representation of Green Club projects focused on community justice, but this was met with opposing assumptions about entrepreneurialism as siloed individualism enacted in neoliberal competition against peers (even against peers from the same schools and programs). While adult supporters negotiated with other teachers to switch students' tables and gather Green Club members among three adjacent table rows, youth representing two different Green Club project groups offered to organizers that they could share one single display area to avoid separation and ensure

they could enjoy the day's events together in partnership as opposed to competition.

With these manifestations came messages about who is a legitimate entrepreneur, and what counts as an entrepreneurial venture. However, both symbolic and physical positioning worked against the shared efforts of youth innovators and the adult instructors seeking to support their actions for change. For example, some of the youth expressed disbelief when announcements were made that there would be prize categories for food-related and fashion-related ideas, but not for nonprofit, eco-design, or high-tech ideas. The Faire, then, could be understood as a microcosm of the broader reality of conflicts between the purposes of capitalist structures traditionally mediating entrepreneurialism and the purposes of social entrepreneurial making toward STEM-empowered social futures for community justice and sustainability. Differences between Green Club members' efforts and traditional conceptions of entrepreneurial practice were already, whether explicit or not, woven into the fabric of entrepreneurialism as defined by powerfully positioned institutions like the city organization hosting the Faire.

Further, noticing how their work was different was a turning point for youth to recognize and push on the limiting norms of this entrepreneurial community's power structures. As the judging time wore on, Green Club members began to tire of sitting and waiting to be visited. The project teams started taking turns having one group member "watch their space" as a trusted representative of their collective in case judges stopped by expecting a presentation, while other group members traveled to view other projects. They returned with product samples, business cards, and political critiques about what their competition added to the entrepreneurial landscape of the city. "Those cupcakes are really good," shared one youth, "but doesn't [the city] have enough bakeries?" Another youth incredulously proclaimed, "One kid is literally just selling hot dogs from a hot dog stand. Is this a carnival?" Where others sought to reproduce traditional structures of business seen around their city, Green Club youth called out reproduction as inferior to innovation.

Youth also took issue with implicit rules of conduct dictating and rewarding what they perceived to be more reductive and outdated performances of entrepreneurialism. For example, while most Green Club members had dressed up in jackets and skirts, one member, Cory, happily donned a black, baggy hoodie. For Cory, one of the Timmy creators, his clothing style was a part of who he was—a critical dimension to his fashion-related project. As one Green Club mentor walked around helping youth place their jackets over the backs of their seats, Cory shared his intention to keep his hoodie on for the duration of the event. We supported this. One mentor (the first author) high-fived him, assuring him that he "looked

great" and that his desired self-positioning practice in a room full of business suits was both appropriate and valued. As the clipboard-carrying judges began slowly sauntering around the room with unsmiling faces, one older female judge asked Cory to stand, lower his hood, and offer his hand to her for a professional shake. He obliged. As she walked away, he said, "She told me to act respectful." He said the comment didn't bother him, but he wanted to keep his hood on as part of his outfit and message, and he was not interested in changing any part of that plan just to appease a judge. He placed his hood back over his head and leaned back in his chair.

Positioning community solidarity in maker-entrepreneurialism

Related to the practice of community-building through making, youth also engaged in a discourse of solidarity building—away from, and in resistance to, the "systemic, political, economic, and social structures that disproportionately appropriate opportunity according to race" along with "a commitment to challenge and alter them" (Parsons, 2005, p. 26).

Rather than currently popular social entrepreneurship narratives of individual-level advocacy, youth critically engaged in ways that sought to bring people together to address community and institutional contexts and dynamics of injustice as more collective and social projects. This differed from entrepreneur as an individual money-maker, but it also differed from entrepreneur as individual hero. Instead, the Green Club youth came together to challenge structural forms and contexts of inequity inherent in extant modes of making and entrepreneurialism. Youth questioned who a customer or client could be, who deserved the opportunity to use their designs, how and within what contexts profit could be defined, how the excellence of design quality should be judged, who was qualified to judge design excellence, and how maker-entrepreneurialism could be defined as a more critical and collective effort within community coalitions.

Across all Green Club groups, collective forms of community wisdom and presence became central to how youth communicated the power of their maker projects to others. For example, the No-Home Phone group (Jazmyn & Iyanna) foregrounded a collective sharing of stories of their own experiences being home without a parent or a phone and the ensuing challenges they and community peers experienced. In two video artifacts they produced to promote their project at the Entrepreneurial Faire, they connected these commonly experienced challenges as shared knowledge grounded in their community.

In their "business plans," all the youth positioned their projects at a community-centering intersection of "high-tech" and "non-profit," even though these were not official categories. Their communication materials discussed how and why they defined their maker design efforts as embodying this particular niche. For example, the two designers of the Little Free

STEM Library used their business plan form to share their understandings of a specific community-focused gap in resourcing:

> At the [Community Center] we do not have a library. At school, we hardly get any time to use the library and the school library does not have many books. It is also hard for our parents to take us to the library. Lots of kids do not have library cards, either. Another thing we have been thinking about is that there are no books for us to read about science and engineering and how to do different projects at home. Even if we find a book, we cannot always bring it home and we also cannot keep it for a long time … And many kids do not have the money to buy their own books or supplies to make and invent things.

A centering aspect of solidarity building involves a political effort to receive each other as one's own, and with a responsibility to "produce the best possible outcomes" (Parsons, 2005, p. 27). Across these domains, youth foregrounded identified community needs tied to socioeconomic and geo-political dimensions of life in lower-income communities. They addressed needs that most economically secure families take for granted (e.g., access to books). Their descriptions layered additional dynamics of concern captured by the nuances of their designs. For example, the Little Free STEM Library group explained that access to books involved much more than deciding to go to a library. It involved securing transportation to/from that library during hours the library was open, being able to acquire a library card (requiring proof of residency), finding compelling books and completing reading within a time-frame to avoid incurring a punitive fee.

Green Club members thus co-opted the neoliberal-sounding category of "Competition" and resituated it within their critical maker-entrepreneur collective as "helping to meet a need." This work leveraged their evidence-based arguments that the particular community needs identified were not yet being addressed by traditionally recognized structures of power. For example, the designers of the DIY Videos argued in their plan that:

> Our DIY videos will help kids learn … In Great Lakes City there are not many afterschool STEM programs, and definitely not many kid-friendly makerspaces. Where will kids learn these skills? In our videos, of course!

The public transportation group took the opportunity to critique what they argued to be a more hierarchical structure for bus heat:

> … [A] company recently came out with a bus that has a heated seat for the driver, but only for the driver (that design would be truly unfair to all the bus riders) … People have long, hard days too, especially if they have to deal with kids or if they're homeless. They have to go through the struggle of walking out in the cold to get to the bus, so when they are on the bus they deserve to have heated seats too.

Youth argued that the needs they addressed were widely applicable given the broad scale of systemic injustice experienced and evidenced across their local community. Therefore, a coalition of many different innovators and power-holders could be helpful for making broader, systemic changes to structures that mediated life practices. For example, the Timmy group proclaimed: "Our competition is from large shoe companies: Nike, Adidas, Timberland, and Jordan. However, we hope to join with these companies to make this new heated feature available on all platforms."

Leveraging a struggle for meaning and legitimacy toward re-envisioning maker-entrepreneurialism

Youth critically reconfigured criteria of success in maker-entrepreneurialism, through the development of a collective strength against injustice. When the Timmy group won a cash prize, Maken shared mixed feelings about the recognition that his team had received. They had developed a design that was meant to be free for those of lower-income, a design driven by a commitment to community members in need. He disagreed with the idea of individually benefitting from such work, and he requested permission from the Green Club founder to donate half of his individual winnings back to the program, "so we can get better snacks." He wanted to share the economic reward and recognition with his peers. This was a concrete action demonstrating his deep commitment to community well-being.

Youth understood that the particular structures framing this available platform for sharing their work in public would hold consequences for how their work was perceived, defined, and taken up by others. Though unsure about what to expect, youth knew they were about to enter a space of power and rules/criteria for success beyond their control. Upon witnessing and experiencing the very real limits of externally defined criteria for success, youth acted to establish their own definitions and counter-criteria. They took into account criteria they felt the event's business world was generally blind to, missed, or ignored, including attendance to the complexity of contexts and impacts on humans and communities. Comparing her group's No-Home Phone prototype to other projects showcased, Iyanna shared, "I've noticed that lots of them involve food … but ours actually involves safety. Which not all the time people can find something that would help them with safety. Lots of the foods are … very simple."

In that moment, Iyanna provided a critique of the dominant framing of entrepreneurialism, a framing that valued maximizing leisure and pleasure. Comparatively, Iyanna and her peers were approaching entrepreneurial making from a position of *living* inequality (e.g., with needs-based designs to ensure community safety, etc.). In naming the difference and emphasizing her group design's comparative complexity and helpfulness in the same

breath, she spoke truth to power and established her efforts, perspectives, and expertise as a needed presence in that entrepreneurial space.

In another example, one week after the event in a reflection session, Keke and Amara rejected the judges' positionings of them and defended their work as worthy of public honoring: "I should have ran up there to that stage when they were taking pictures and jumped into one of those pictures," Amara exclaimed, as she laughed and jumped sideways with arms wide in a mock "photo bomb" move. In their shared reflections, professional dimensions flowed into social, through avenues of interaction along race, money, and power. Youth connected the injustice they felt at being ignored in a White space of professional entrepreneurial practice with a variety of racial injustices they had witnessed on television that year, from police brutality to racist comments and violence at national political rallies. They moved fluidly to economic and maker-design arguments, describing the structure of cash prizes as shallow charity that could not come close to the connected economic, epistemological, and community justice they deserved as Black STEM entrepreneurs. As Amara and Keke (creators of the Warm Your Bodies) stated in reference to the challenges of getting recognized as they wished to be defined at the Faire by the judges: "They said 'no offense' but then, what they said was offensive." A judge had critiqued their beta prototypes as not quite market-scale ready. This criterion was not explicitly required at the Faire but was nonetheless enforced as a rigid norm by a power-holder, revealing that judge's particular assumption for defining winnable contenders at an entrepreneurial showcase. That assumption erected an effective barrier against recognition. "That's what made me upset," Amara explained. "Not the fact that I lost, but the fact that they said that." And later:

Keke: All my life I had to fight. [stated in sing-song voice, quoting a popular Kendrick Lamar song intro, which quotes Alice Walker]
Amara: It's true! Black people have had to fight.

Such reflections on connections between different forms of injustice, and on young people's power to choose action against injustices with agency and purpose, were actively shared by youth across the groups during the after party and in the school year's remaining program meetings.

Green Club members honored each other that day as they complimented their peers' efforts and achievements amidst injustices. In a blog post Fall wrote that day for the program's website, she highlighted strengths of her group's project as well as the Timmy group's:

> Today we all went to the [city center] for the [youth entrepreneur] event to show our projects! Samuel and I showed our library. We all did amazing! I just wanna say congrats to the group that won! The group that made the Timmy won first place for tech! The Timmy is a heated light up shoe to keep people warm and healthy in the winter. It is going to be for free or really low cost so that everyone can have one. I had lots of fun. My group got a lot of good comments about our little free library. It was the hardest I ever worked. The library will help the kids read and also make things! I will report on the rest of the groups next!

While Green Club mentors had immediately begun discussing plans to never return to the showcase, youth members refused these adult ideas that would have accepted the showcase's attempts to position the group as outsiders. They argued that day, and in the weeks following, to go back together the following year and reclaim the recognition that was rightfully theirs. They deserved recognition in the world of entrepreneurialism as STEM innovators for community justice, and they desired the continued space to claim it. Moreover, they wanted more opportunities in the future to push their vision of a high-tech and critical form of entrepreneurship, driven by a feeling of greater purpose and community need. "We've got to teach them how we go out in the community and do this," Samuel argued in a follow-up reflection interview.

These insights carried forward and became sharper the following year, when the Green Club members decided to reenter the youth entrepreneurship showcase with an even more explicit community justice orientation in their projects and presentations. In that next round of designs, several were also developed explicitly in response to the Trump administration's proposed budget cuts reducing support for afterschool and community services (Brown, 2017; National Association of Social Workers, 2017). These designs included a by-kids, for-kids educational YouTube channel to expand access to informal STEM learning, and a phone app to coordinate the sharing of local data on homelessness and city community member's experiences of housing injustice (Greenberg, 2019). Jazmyn, the app designer, recently explained her vision of entrepreneurialism in a follow-up interview for this study:

> An entrepreneur is someone who is working to improve the lives of others whether it's big or small. We use science, engineering, social skills and other aspects to help better our community in some way … Yes money would help but it's not what we're going for. We're looking for a bigger change.

To Jazmyn and other youth, entrepreneurialism is about seeking improvement, but it should also be about making life better for more than just oneself. "Entrepreneurs" can be defined in a way that demands more from them than profit margin. The world can choose to look for something "bigger" than money as an indicator of successful entrepreneurs.

It can instead look for what positive changes entrepreneurs bring to the world, and how those changes help.

Discussion: Toward a critical maker-entrepreneurialism

The field of the learning sciences has raised important questions on what it means for learners to develop disciplinary identities as people learn in real-world contexts (Lee, 2017). While making and entrepreneurship are not core disciplines in formal education, questions around who one is institutionally welcomed and supported to be, and become, as a maker-entrepreneur are increasingly important as more learning spaces feature making and entrepreneurship as interconnecting foci for learners. Furthermore, we argue that youth efforts to construct a critical maker-entrepreneur identity, as with other disciplinary identities, are always shaped in complex social contexts, layered with narratives, often in tension, and with entrenched messages regarding the boundaries and contours of social, cultural, political, and disciplinary becoming. Just as these contexts frame and affect youth efforts, youth work to re-construct such contexts through their critical maker-entrepreneur practices in action (Allen & Eisenhart, 2017).

Our analysis contributes to this dialogue by looking more closely at a) the struggles that shape identity work in making and related entrepreneurial practices, serving as a model for how contentious practices toward identity work are shaped at the powered boundaries of justice. We also explore how such youth practices work to b) disrupt and restructure power through reshaping processes that youth deliberately direct toward their re-envisioning of maker-entrepreneurialism.

Our analysis also serves as a cautionary tale for the political complexities of this kind of identity work. That is, acts of justice (and resistance of oppressive norms) are critical to the kinds of identity work that youth do. The community-centered action Green Club youth took in their making was a central component of their contentious processes of maker-entrepreneur reconfiguration. It was not just conflict, but conflict rooted in historicized injustice and negotiated through a recognition that youth could engage. Thus, locally grounded youth processes of making and entrepreneurship were interwoven with dimensions of power, meaning, and difference that informed and shifted their engagement both within moments and across scales of time and space (e.g., from local to systemic, and back again). They developed and enacted disciplinary identities as critical maker-entrepreneurs through this dynamic, interactional process across dimensions.

The youth were able to experience a different type of making and learning through their program-supported process of developing a critical

maker-entrepreneurialism. This process involved developing responses to community-defined challenges connected to historicized injustices, using making as a practice for future-looking social change. Then, they worked to explain these designs to their city's entrepreneurial community through their Faire application materials, foregrounding a discourse of a) building community in solidarity and b) re-humanization as central tenets for entrepreneurship. Their day-of actions promoted these practices and discourses toward a reimagining of who maker-entrepreneurs are and what they can accomplish in the world.

A critically redefined maker-entrepreneur identity in practice

The Green Club youth presented themselves at the Faire as a critical collective of innovators, engaging in maker-entrepreneurialism to re-envision and build a better world. This justice-centered view of disruptive innovation produced a space of political struggle as it butted up against dominant views of what could bound and define maker-entrepreneurialism. Working with each other and mentors, youth navigated and built off of the political struggle their efforts engendered to create a critical maker-entrepreneurialism and to promote that identity in practice publicly through embodied enactment.

First, through their critical enactment of STEM-rich, community-centered making, youth disrupted hegemonic discourses of who makers and entrepreneurs are and what they can/should do (Calabrese Barton et al., 2017). Through their discourse and actions, the youth made it clear that maker-entrepreneur hegemony was being upheld by Whiteness, high-economic schools, and adults who believed in centering individualism and profit over wider benefit and innovation (e.g., Nasir & Vakil, 2017). They agentically challenged this hegemonic discourse and, through their actions and vocal presence as justice-oriented thinkers in an idea-sharing space, called for the local entrepreneurial community to confront its own limitations. Looking beyond these limitations, Green Club youth enacted identities-in-practice that revealed concrete ways in which maker-entrepreneurs could (and therefore should) transform individual and community experiences and opportunities for new social futures, through their collective innovative spirit to support their community. This commitment drove their innovation further by interweaving purpose and process, technique and intended impact. This collective dimension matters. As Tara said, "It's not just one person making one project. It's how all of the projects work together. We're, like, in this together." Making money was enticing, but not the primary goal. Community justice-oriented innovators could accomplish more than that. Critical maker-entrepreneurs could use entrepreneurialism as a framework for noticing and discursively disrupting systemic injustices.

They could use STEM inventing to reimagine the future as a more humanizing place.

Connected to this, Green Club youth also demonstrated an understanding of the relationality of the identities of makers, entrepreneurs, and STEM professionals. They performed as innovators for community justice through STEM-rich making, individuals who appreciated an entrepreneurial spirit of design and challenge but toward collectively improving the world for others. As Fall noted, "we put our energy into projects that matter, not something that just looks fancy." In doing so, the youth presented to this new community how such identities can purposefully intersect and belong together to bring transformative outcomes in socially just ways. This point advances beyond the recent construct of social innovator (e.g., Van Wijk et al., 2019). Youth did seek to re/negotiate and co-create within "embedding dynamics" of institutional context, as presented by Van Wijk et al.'s (2019) three-cycle model (pp. 889–892). But they also called for a more explicit confrontation and dismantling of institutional contexts of power and oppression, especially the disruption of unjust racial hegemonic practices in business and society. These contexts would not be able to be dismantled through the creation of "alternative proto-institutions" alone (Van Wijk et al., 2019, p. 891). Youth recognized this, and therefore sought to engage on platforms of power such as the Faire in order to gain exposure in powered spaces, leveraging maker-entrepreneurialism toward coalition-building (e.g., this was seen in their collaboration-seeking conversations with entrepreneur peers whom Faire organizers had attempted to position as competitors).

Youth constructed identities as critical maker-entrepreneurs with and for community justice, eschewing the boundaries of more traditional and more visible for-profit maker-entrepreneurialism definitions. These identities required a deep merging of community wisdom with STEM knowledge and practice, steeply grounded in a political understanding of place (Sharples, 2017). What we learned from this action is that the identity work that youth do is intimately interwoven with lived experiences in and with community and with developing understandings of positionings and actions in a broader, power-mediated world. For example, Cory kept his hoodie on to represent his definition of maker-entrepreneur as legitimate and worthy of being present. And as Green Club members sat together at the awards convening, they kept sharing positive remarks to each about what they valued about each other's' projects vis-à-vis the broader Faire. For example, Samuel remarked, "our projects were helping people with real problems. We were great!" and Maken noted, "We was so high tech. Like, no one can touch that." Youth efforts for collective recognition, grounded in the political struggle of historicized injustices, modeled an alternative framing for entrepreneurs as concerned humans making change together.

Disrupting and restructuring maker-entrepreneurialism

As youth restructured entrepreneurialism toward community justice, they enacted a new vision of making and entrepreneurship. The Green Club members' maker projects embodied values that have been marginalized in entrepreneurialism, including care, sharing, and community building. This stance rejected traditional and neoliberal constraints on entrepreneurialism such as fear of competition and the related urge to erect boundaries instead of co-creating shared spaces for collaborative innovation. This is not unlike the "'Entrepreneurial Self' of the biophilic consciousness," an idea that foregrounds human-nature and human-human connections as central to design (Fernández-Herrería & Martínez-Rodríguez, 2016). This idea is described as the "empathic universal connectivity, inspired by the ethics of care, which means an ecological and social self which extends to the entire community of life" while pushing back against the individualist, profit-driven neoliberal business approach (Fernández-Herrería & Martínez-Rodríguez, 2016, p. 324). As Fernández-Herrería and Martínez-Rodríguez (2016) argued, "being" *with* others must become a higher priority than "having" *over* others, as a general law for humanity's survival through "care, interdependence, global responsibility, and planetary citizenship" (p 324).

Youth defined their own reasons for engaging with STEM-rich making and entrepreneurship, seeking more meaningful purposes than economic gain, as noted by their project rationales in Table 2. They agreed that they deserved award money and a chance to play in a game they knew would probably be rigged against them and their efforts and values. But they also sought to redefine the whole game and its rules. They desired to create more complex structural changes than simple money flow (e.g., this was demonstrated in Maken's request to donate part of his prize money to fund more snacks at Green, arguing it could increase the productivity of innovations to help the community). Youth re-humanized what it meant to entrepreneurially make by re-centering people in discourse, practice, and outcome.

Youth co-opted and restructured making as an entrepreneurial act toward community justice, using STEM as a set of background learning tools to support such action. They sought to engage the world more critically than the social entrepreneur (e.g., going beyond influencing the business model, toward more substantially altering relationalities in-and-through entrepreneurial making). As they demonstrated, critical maker-entrepreneurs can be helpers, teachers as well as learners, leaders as well as coalition members, and designers of new social futures. Likewise, STEM-rich making can be a viable pathway toward justice. We noted earlier how Tara believed their videos could reach and teach anyone. These ideals of

helping, teaching, and changing were threaded through their practice and discourse. It drove why and how these youth sought to make the projects they did. Maken summed this point up with the argument, "Nowhere else, not like school, can we make things that actually help, actually do something to make a difference." Thus, how they interacted in the entrepreneurial maker community critiqued and challenged the hegemony of adults who believed in centering individualism and profit in entrepreneurialism. They pushed dialogue with ideas around collectivism, nonprofit structures for entrepreneurialism and innovation, and community justice as a rightful bottom line for business.

This did not mean that youth did not seek increased economic and social capital through interactions with neoliberal systems of power; they (and we) simply defined such recognition as inadequate to achieve structures of practice youth sought to create. To be sure, youth initially presented the idea of entering this Faire to program mentors with arguments that included their desire to individually benefit from cash prizes (e.g., see Table 1). They maintained understandings of their worthiness to access economic and social capital that other entrepreneurs enjoyed and leveraged. But their focus was also more prominently on increasing exposure for their efforts to achieve community justice, whereas the overall focus at the Faire was limited to monetary profit alone. In comparison to and as a type of visual critique of the limiting and oppressing monetization/domination focuses surrounding them, they presented an alternative way to see, understand, and interact with the world as critical maker-entrepreneurs.

Youth enactments of critical maker-entrepreneurialism were complex and nuanced, revealing a youth capability to engage with unjust systems for critically informed, multi-sourced reasons and toward critically conceived, multilayered outcomes. Rather than seek to protect naïve youth from capitalist corruption, then, we recognized our adult responsibility to support young people's desires and capabilities to engage with those unjust systems (e.g., through transparent discussions of reasons to engage or not, and through committed actions to follow-through with our support at each step of their critical maker-entrepreneur process). Mentors openly grappled with implications of supporting youth in entering an individualism-framed, entrepreneurial competition (e.g., complicity in promoting individual ascendency as a legitimate exit from collective oppression). But we argue that a more multidimensional understanding of youth desires to be and become in a complex world led us to co-construct with youth a way to support their efforts to access individualistic-framed power while simultaneously co-opting and remixing that power in coalition. For example, after organizers commanded youth to divide up and spread out, Green Club youth and adults acted outside of event norms by insisting on moving tables and shouting across the crowd to each other to coordinate this movement. Youth made clear their desires to take what they could from its hegemonic power

structures (e.g., cash and public recognition among power-wielders in their city), while using its public platform to critique and challenge that hegemony through pushing open representational boundaries.

Youth framed their participation in the Faire as about sharing their work and engaging with others on what it meant to be critical maker-entrepreneurs. Instead of feeling completely constrained by the dominant economic narrative, they were equipped to publicly critique and challenge it. Youth leveraged skills of soliciting community dialogue to identify issues to address through making, along with a wide repertoire of maker skills (e.g., woodworking, circuitry, sewing skills, 3D printing), collaboratively mobilizing distributed expertise available in their community. This allowed youth to make-to-redress community injustices (Tan & Calabrese Barton, 2018). STEM-rich making can thus be a site for "framing, unpacking, and interrogating salient concerns and needs with the tools of science, engineering and communities" as a fulcrum for youth to "innovate unique solutions to address particular inequities in their lives" (Calabrese Barton et al., 2017, p. 4).

In this way, the home base of making, STEM learning, and practice became disrupted as well. It became more than a pathway toward asset development through individual participation in a neoliberal/capitalist economy. It became co-opted and restructured as tools toward justice-oriented outcomes. As Fall and Samuel explained, "STEM is important for people to go to college and get jobs, and also to make things that help out at home and in the community."

Implications and conclusion

The youth in this study offer an image of what the culture of entrepreneurialism could look like if the bottom lines of businesses were community justice and sustainability. As they worked to define and demonstrate a *new* and more critical maker-entrepreneurialism, their centering of diverse identities, perspectives, and backgrounds pushed for an industry-wide reimagination of what assets for innovation can include and do. STEM-rich making was a tool youth deliberately chose to take up because they sought to "make" a better future world (not just argue for one). Furthermore, their foregrounding of community interests and needs pushed for a rethink on what can and should be defined as central data for their maker work. In many respects the "products" of their making was not the tangible artifact in so much as it was the just social future they hoped for. Their challenge to entrepreneurship representatives to take all of this into account urged a redesign of both making-related and entrepreneurship-related learning and practice as tools for justice-oriented innovation. And with their demands for community justice as an urgent value for any business that hopes to become

sustainable, youth proclaimed and leveraged their powers as both consumers and producers in a world they want to change.

What could become possible if educational and industry leaders were to move beyond traditional and neoliberal constraints on making and entrepreneurship, such as prizing competition and profit? How might we build more—truly inclusive—shared spaces for collaborative innovation? Currently, most entrepreneurial making spaces and events, as exemplified by the Faire, are dominated by neoliberal ideals and elitism-oriented participation. The youth experiences in this study call for an urgent reexamination and opening up of such spaces—a process that will necessarily involve challenging inequitable power relations and normative structures. We view youth critical maker-entrepreneurs as a call to action for the maker and entrepreneur fields, offering a richer and more socially consequential approach for the benefit of all.

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